



STATE & PRIVATE FORESTRY FOREST HEALTH PROTECTION SOUTH SIERRA SHARED SERVICE AREA



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**To: Jim Larmore, Heavenly Ski Area, Snow Surface Director
Terry Marceron, Lake Tahoe Basin Management Unit, Forest Supervisor**

From: State and Private Forestry, Forest Health Protection, South Sierra Shared Service Area

Subject: Mountain Pine Beetle Activity at Heavenly Ski Area, Lake Tahoe, CA

Introduction

At the request of Jonathan Cook-Fisher (Recreation Specialist) and Mike Guarino (Special Uses) of Lake Tahoe Basin Management Unit, Beverly Bulaon and Martin MacKenzie (South Sierra Shared Service Area) conducted a forest health evaluation of Heavenly Valley West, a permit recreation area within the Lake Tahoe Basin Management Unit (LTBMU). Forest and Heavenly personnel were concerned that current activity in the recreation area would reach unacceptable levels since bark beetle activity had been steadily increasing in surrounding locations. This report covers a site visit conducted on May 13, 2010 accompanied by Paul Guarnaccia, Assistant Silviculturist and James Larmore, Snow Surface Director; and ground surveys by FHP late summer.

Heavenly Ski Area is located on the southeast shore of Lake Tahoe Basin Management Unit (Alpine County, CA and Douglas County, NV; Township 12 N, Range 18 E, Sections 1; Township 12 N, Range 19 E, Sections 6; Township 13 N, Range 19 E, Sections 31; Township 13 N, Range 18 E, Sections 36), between the state borders. The ski area composes 4,800 acres of Heavenly Valley. Elevations range from 7,500 to 10,000 feet at Monument Peak. Precipitation for this site averages 31 inches annually¹. Stand compositions for lower elevation areas are 50% lodgepole pine (*Pinus contorta*) with 30% scattered red fir (*Abies magnifica*) and 20% western white pine (*Pinus monticola*), transitioning chiefly to western white and whitebark pine (*Pinus albicalus*) above 9,000 feet. Stand age ranges of the lodgepole stands is about 50-120 years, possibly 150-300 years for western white pines. Small tree regeneration was not visible due to snow cover.

¹ SNOTEL data average 1999-2009, <http://www.wcc.nrcs.usda.gov/>

Observations

Aerial detection surveys from 2006 through 2009 of LTBMU found bark beetle associated mortality slowly increasing, with some locations exceptionally hit hard by mountain pine beetle (*Dendroctonus ponderosae*) and Jeffrey pine beetles (*Dendroctonus jeffreyi*). High Meadows, located southwest of Heavenly behind Monument Peak, has experienced 75-100% mortality in lodgepole pine stands beginning in 2006 (see Appendix A). Ground surveys conducted August 2010 found mountain pine beetle is still active but at a much reduced level: only a third of the total number of trees attacked were observed compared to last year. Some areas where new attacks were expected due to previous years of continual mortality were devoid of activity. Along the ridgeline of High Meadows, mature whitebark pine stands were experiencing similar infestation levels as lodgepole – up to 50% of stand mortality. On the west side of LTBMU particularly along Ward Creek, older activity pockets continue to have new attacks developing around them, but number of beetle caused mortality were fewer than last year. Mortality within the boundary of Heavenly remained at low levels from 2004-2008; however in 2009, 150 acres were mapped via aerial survey. Mortality of lodgepole pine within this polygon averaged one dead tree per acre.

Ground surveys during the field visit were directed around mortality pockets identified from recent aerial surveys, mainly Heavenly Valley west. Mountain pine beetle (*Dendroctonus ponderosae*) was identified infesting western white (*Pinus monticola*) and lodgepole pines (*Pinus contorta*). Basal areas in affected stands ranged from 150 - 200 ft²/acre. Mortality was concentrated in mixed stands, where diameters averaged 15 inches for attacked trees, but as small as 6 inches were also targeted (see Figure 1). Larger diameter white pines were attacked initially and in higher numbers (of trees) compared lodgepole pine. The oldest attacks were estimated to have initiated in 2006, most mortality occurring in 2008. Over 50% of the dead trees in plots were attacked in 2008. A total of three western white pines were found with 2009 attacks in surveyed areas, only two of them were found with live brood. No recent infestations in lodgepole stands were detected.. At the upper elevations, comprised of primarily western white and whitebark pine stands, no recent bark beetle activity was observed. The polygon of mortality mapped during the 2009 aerial survey was difficult to access, however, we were able to view a large portion of it from the observation deck at the top of the gondola – and did not see any crown fading at that time, nor was recent mortality detected during the 2010 aerial survey in this same area.



Figure 1. A group of lodgepole pine killed by MPB, Heavenly Ski Area North, Lake Tahoe Basin Management Unit.
Photo taken April 2010. .

Discussion

Since stands in Heavenly shift from lodgepole pine dominant to partial component, recommendations to reduce current overall stocking to 60% of maximum stand density index (SDI) or reducing basal areas to less than 80% of “normal” stocking for a given site will suffice and help prevent bark beetle infestation. Improving stand vigor by thinning overstocked areas can help prevent mountain pine beetle-

Mountain pine beetle is a native bark beetle that attacks a wide range of pines in California: ponderosa, sugar, western white, whitebark, and lodgepole pines. Evidence of attack can be determined by “pitch tubes” – small globs of resin mixed with bark dust of boring beetles. Successfully attacked trees will have numerous pitch tubes up and down the tree bole. One full year is required to complete its lifecycle, thereby crowns of attacked trees do not start fading until the following year. Group kills often occur in overstocked stands or older stands with high percentages of susceptible hosts. In California, prolonged drought events can significantly weaken trees resulting in higher susceptibility to bark beetles or other damaging agents.



Figure 2. *Mountain pine beetle-attacked (2008) stand along Galaxy Run composed of small diameter western white pine, lodgepole pine, and red fir (not a host of MPB).*

Mountain pine beetle activity within Heavenly Ski Area is fairly low in comparison to severe mortality occurring further south at High Meadow or other areas of the LTBMU. High risk factors for mountain pine beetle attack were found at High Meadow: stands averaged over 80 years in age, most stem diameters were greater than 8 inches, and stand density exceeded 120 square feet/acre. Main differences between sites are stand density and diversity. Basal area at High Meadows ranged from 160 – 400 ft²/acre with nearly 90 – 100% lodgepole component, compared to basal areas of 100 – 180 ft²/acre with 25% lodgepole, 65% western white, and 10% red fir at Heavenly. It has been determined that lower stocked stands have unfavorable microclimate conditions that deter MPB attraction into those stands (Bartos and Amman 1989, Amman and Logan 1998, Whitehead et al. 2005). . Based on current levels of recent MPB activity, mortality in lodgepole or western white pine stands is not expected to significantly increase next year.

Managing lodgepole pines stands to maintain a density management zone around SDI 200 (Landram 2009, pers. comm. to S. Smith) should help maintain healthy stand conditions. This lower level for management is based on data from R5 FIA plots and is somewhat higher than recommendations on drier sites in Oregon where Cochran and Dahms (2000) found mortality to be lower in stands managed between SDI 114-170. Dense lodgepole pine forests are more prone to wind or snow-loading breakage after thinning and may require multiple entries to develop wind-firmness in residual trees.

Restoration and promotion of tree health in high-value (ecological, aesthetics, recreation, etc.) stands should be considered to minimize future tree mortality. An active tree monitoring program combined with reducing tree density would be an effective management strategy. Annual examination of trees for signs or symptoms of bark beetles (pitch tubes, frass, beetles under tree bark, etc.) and diseases would provide trend information on tree health, enable land managers to identify and remove infested trees prior to beetle emergence, and assist with hazard tree management. Basal area reduction in high density areas should reduce future bark beetle-caused tree mortality and decrease fuel loads. Reducing inter-tree competition improves individual tree vigor and growth, makes trees less susceptible to insects and diseases and promotes overall healthier stand conditions.

Heavenly Valley Ski Area is proactive in promoting healthy stands while preserving most of the natural structure and composition. Personnel are vigilant at identifying hazards and interested in removing infested trees to reduce bark beetle activity. Assessing stand susceptibility to mountain pine beetle followed by implementing a prioritized vegetation treatment plan can facilitate meeting land managers objectives for this area. Protection of individual high-value trees can also be obtained through insecticide application to tree boles. We look forward to assisting in developing your integrated management strategy.

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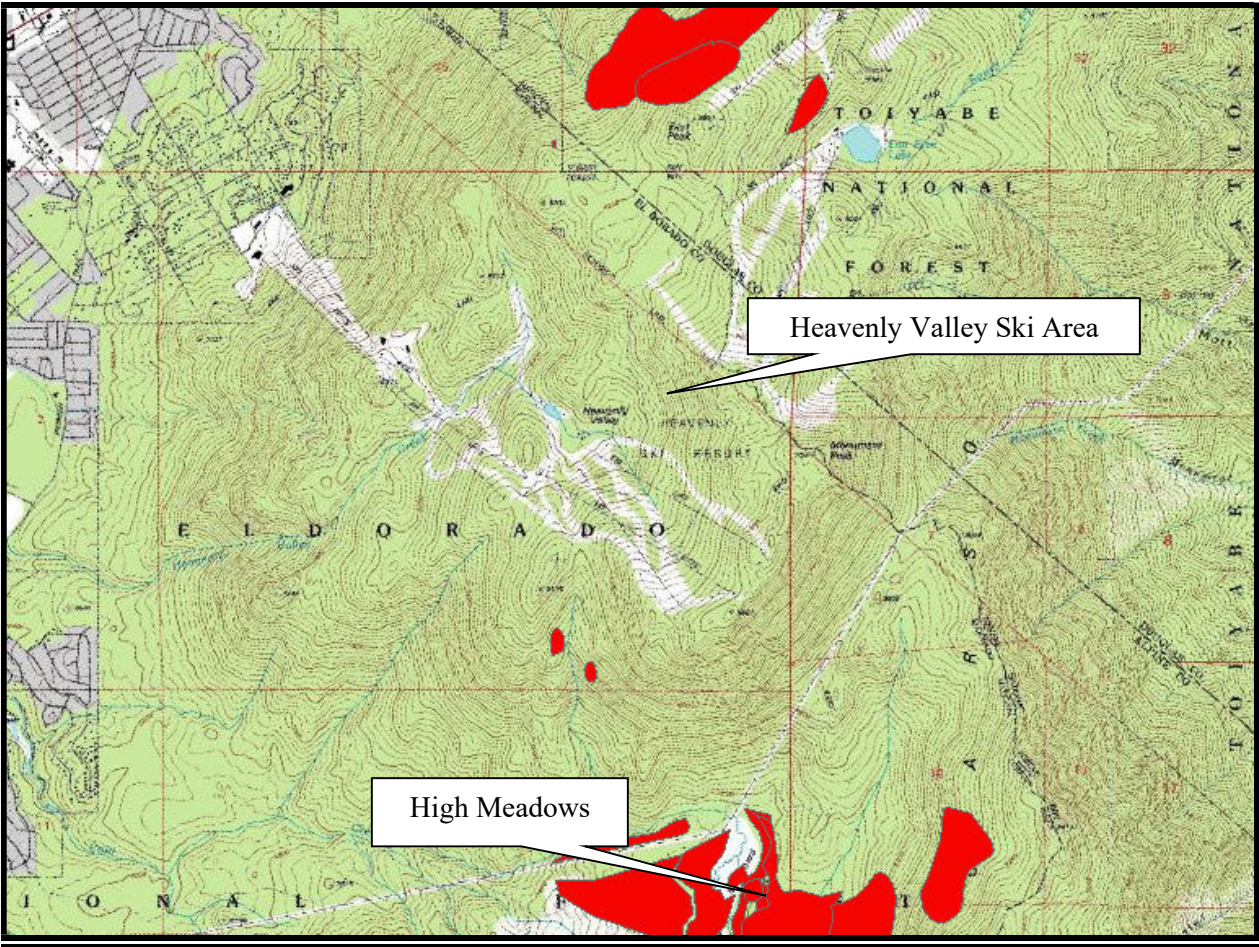
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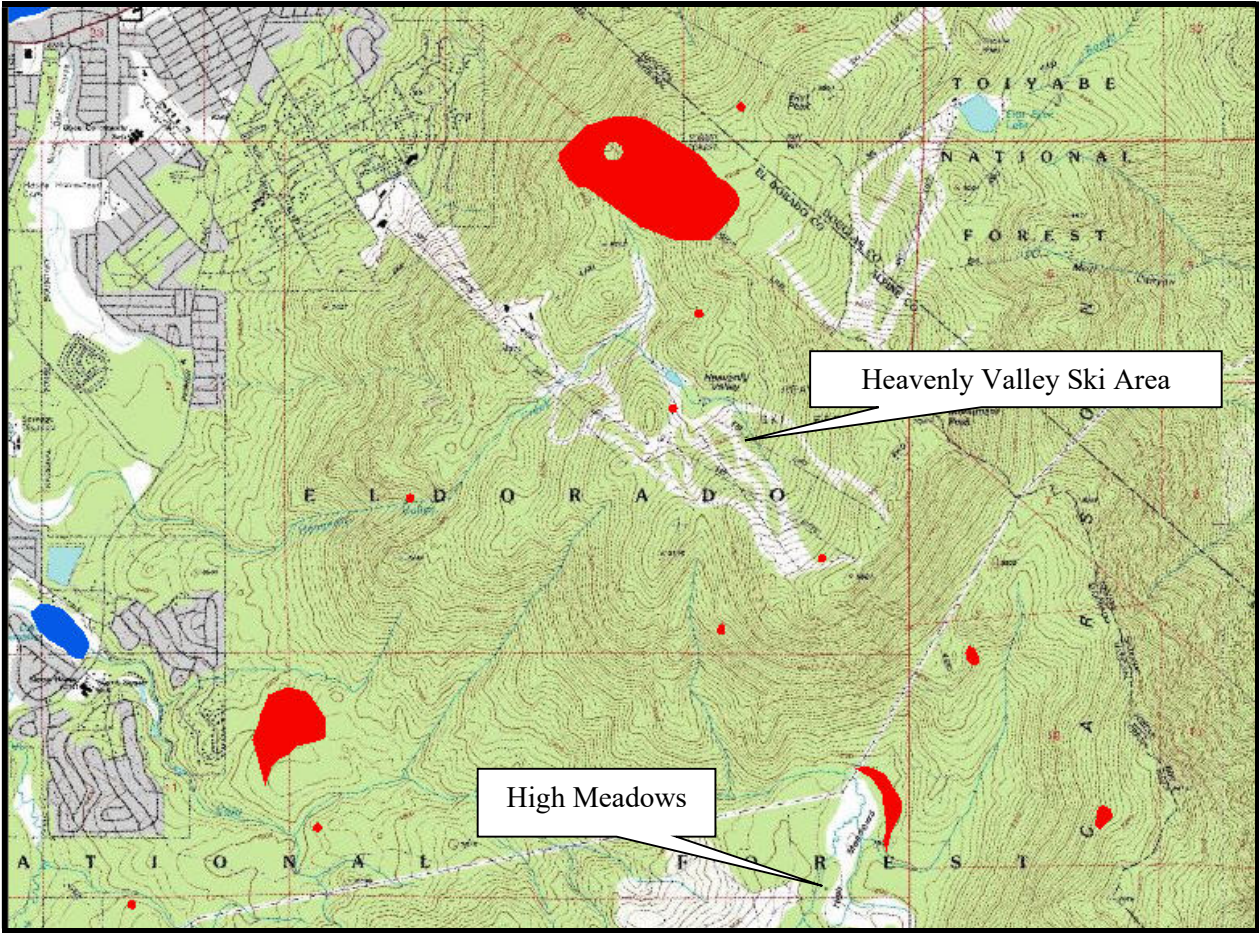
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Appendix A. Polygons with tree mortality (mapped via aerial survey between 2004-2008): Heavenly Valley Ski Area, High Meadows and other surrounding areas, Lake Tahoe Basin Management Unit.



Appendix B. Aerial Detection Survey Map of Bark Beetle-associated mortality 2009: Heavenly Valley Ski Area, High Meadows and other surrounding areas, Lake Tahoe Basin Management Unit. Note decrease of acres with current mortality around High Meadows.



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